Space Weather Forecast

Issued on Saturday, 18 February 2023 at 00:45 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 Minor/Moderate Storms likely due to CME arrival early Day 1 (18 Feb) and perhaps again Day 3 (20 Feb). M-flares likely, slight chance X-flares throughout (R1-R3 Radio Blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been High with a long period X2.28 (Strong) flare, the strongest of the solar cycle so far, peaking at 17/2016 UTC from a region in the northeast. This region is gradually rotating into view, and appears to have some twisting in its magnetic field lines. Further complexity may become apparent as it becomes more clearly visible. There are a total of eight sunspot regions on the visible solar disc. The largest has shown a little more magnetic complexity, but remains inactive. The other regions are generally mature and either stable or declining. There are two further regions appearing in the southeast, but it is too early to properly classify these. A very fast CME has emerged in association with the Strong flare. Although the majority of this material is directed away from Earth, a shock wave is starting to become apparent which may have some Earth directed component. Assessment of this CME is ongoing.

Solar Wind / Geomagnetic Activity: Solar winds continue to be indicative of a coronal hole fast wind. Wind speeds were slightly elevated to elevated, ranging between 450 and 550 km/s. The total Interplanetary Magnetic Field strength declined from initial Moderate levels to become weak. The north-south component initially varied moderately, before becoming weak and variable. Geomagnetic activity was Quiet to Unsettled (Kp 0-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely, with a slight chance of remaining High. The main risk for further significant flaring is the sunspot near the northeast limb.

Solar Wind / Geomagnetic Activity: A CME from the 15th is forecast to arrive at 17/1800 UTC +/- 12 hours. The timing of the arrival is only of moderate confidence. A fast CME from the 16th, has some potential for a glancing impact on the 18th. A recent CME associated with the Strong flare is still being assessed, but there may be some Earth directed component. This could potentially arrive on the 20th. Current slightly elevated to elevated solar winds are due to a coronal hole fast wind and will likely be prolonged through Day 1 (18 Feb) by the CME arrival, before easing during Day 2 (19 Feb). A further coronal hole is likely to enhance solar winds probably during Day 3 (19 Feb), perhaps combined with any CME from the 17th, resulting in elevated winds or perhaps even strong wind speeds returning.

Geomagnetic activity is expected to be Quiet to Unsettled, increasing to Active to G1 Minor Storm, with a chance of G2/Moderate Storms with the CME arrival, before gradually easing Day 2. Thereafter becoming somewhat uncertain as the CME from 17th still needs fully assessing, but perhaps increasing again through Day 3 with a risk of G1-G2 Minor to Moderate Storms if this CME does reach Earth.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is most likely to remain at background levels, but with a slight chance of exceeding the S1/Minor Storm level in response to larger flares.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	60	40	60	30
Strong	G3	No	10	5	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	Yes	20	20	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	15	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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